

MONTHLY WEATHER REVIEW.

Editor: Prof. CLEVELAND ABBE.

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INTRODUCTION.

The MONTHLY WEATHER REVIEW for June, 1897, is based on 2,927 reports from stations occupied by regular and voluntary observers, classified as follows: 143 from Weather Bureau stations; numerous special river stations; 33 from post surgeons, received through the Surgeon General, U. S. Army; 2,588 from voluntary observers; 96 received through the Southern Pacific Railway Company; 14 from Life-Saving stations, received through the Superintendent United States Life-Saving Service; 32 from Canadian stations; 1 from Hawaii; 20 from Mexican stations. International simultaneous observations are received from a few stations and used together with trustworthy newspaper extracts and special reports.

Special acknowledgment is made of the hearty cooperation of Prof. R. F. Stupart, Director of the Meteorological Service of the Dominion of Canada; Mr. Curtis J. Lyons, Meteorologist to the Government Survey, Honolulu; Dr. Mariano Bárcena, Director of the Central Meteorological Observatory of Mexico, Mr. Maxwell Hall, Government Meteorologist, Kingston, Jamaica, and Commander J. E. Craig, Hydrographer, United States Navy.

The REVIEW is prepared under the general editorial supervision of Prof. Cleveland Abbe. Unless otherwise specifically noted, the text is written by the Editor, but the meteorological tables contained in the last section are furnished by Mr. A. J. Henry, Chief of the Division of Records and Meteorological Data.

Attention is called to the fact that the clocks and self-registers at regular Weather Bureau stations are all set to seventy-fifth meridian or eastern standard time, which is exactly five hours behind Greenwich time, and, as far as practicable, only this standard of time is used in the text of the REVIEW, since all Weather Bureau observations are required to be taken and recorded by it. The standards used by the public in the United States and Canada and by the voluntary observers are believed to generally conform to the modern international system of standard meridians, one hour apart, beginning with Greenwich. Records of miscellaneous phenomena that are reported occasionally in other standards of time by voluntary observers or newspaper correspondents are generally corrected to agree with the eastern standard; otherwise, the local meridian is mentioned.

CLIMATOLOGY OF THE MONTH.

GENERAL CHARACTERISTICS.

The paths of the centers of low pressure did not generally pass over the States east of the Mississippi, and most of them passed north of the Lake Region; the mean pressure was generally deficient. The mean temperature was deficient in the northern sections east of the Rocky Mountains, but in excess in the southern sections, and vice versa on the Pacific coast. The mean temperature was the lowest on record for the month in the Lake Region, the Middle States, and New England. Precipitation was in excess from Kansas to New England, but was deficient in the central Gulf coast. Numerous severe local storms occurred among which the most important were those of the 10th in Minnesota and the 24th in Kansas.

ATMOSPHERIC PRESSURE.

[In inches and hundredths.]

The distribution of mean atmospheric pressure reduced to sea level, as shown by mercurial barometers, not reduced to standard gravity, and as determined from observations taken daily at 8 a. m. and 8 p. m. (seventy-fifth meridian time), is shown by isobars on Chart IV. That portion of the reduction to standard gravity that depends on latitude is shown by the numbers printed on the right-hand border.

The mean pressure during the current month was highest

in southern Florida and nearly as high on the coast of northern California. It was lowest in Arizona and nearly as low in Montana and the Northwest Canadian Provinces and Newfoundland.

The highest reduced pressures were: In the United States, Key West, 30.07; Jupiter and Tampa, 30.06; Eureka, 30.05; Charleston, 30.04; Jacksonville, 30.03. In Canada, Bermuda, 30.11; Port Stanley, 29.97; White River, 29.95; Parry Sound, Ottawa, and Halifax, 29.93; Yarmouth, 29.92; Sydney, 29.91. The lowest were: In the United States, Phoenix, 29.72; El Paso, 29.79; Havre, 29.80; Dodge City, 29.82; Williston, 29.83. In Canada, St. Johns, N. F., 29.79; Prince Albert and Grindstone, 29.80; Calgary, 29.83; Kamloops, 29.84.

As compared with the normal for June, the mean pressure was generally slightly deficient, the principal excesses being a few hundredths on the east Gulf coast and in the Northwest Provinces. The regions of greatest deficiency were New Brunswick, Newfoundland, the coast of New England, the Missouri Valley, and the interior of the Pacific coast States.

The greatest excesses were: In the United States, Helena, Port Huron, and Denver, 0.04; Key West and Galveston, 0.03. In Canada, Minnedosa and Swift Current, 0.04; Edmonton, Qu'Appelle, and Saugeen, 0.03. The deficits were: In the United States, Concordia, 0.07; Havre, Miles City, and Omaha, 0.06; Portland, Me., Nantucket, and New Haven,

0.05. In Canada, St. Johns, N. F., 0.18; Chatham, 0.06; Quebec and Kingston, 0.03.

As compared with the preceding month of May, the pressures reduced to sea level show falls throughout the country. The regions of greatest falls were Kansas and Nebraska and Cape Breton and Newfoundland. The greatest falls were: In the United States, Concordia, 0.18; Dodge City and Wichita, 0.17; Omaha, 0.16; Yankton, 0.15. In Canada, St. Johns, 0.22; Sydney, 0.13; Calgary and Halifax, 0.12; Chatham, 0.11; Minnedosa, 0.10.

AREAS OF HIGH AND LOW PRESSURE.

By Prof. H. A. HAZEN.

During the month of June seven high areas and nine low areas were sufficiently well defined to be charted. (See Charts I and II.) The accompanying table gives the principal facts as to the region of origin and disappearance of these areas, the length of path, and apparent velocity, and a few general remarks are added.

Movements of centers of areas of high and low pressure.

Number.	First observed.			Last observed.			Path.		Average velocities.	
	Date.	Lat. N.	Long. W.	Date.	Lat. N.	Long. W.	Length.	Duration.	Daily.	Hourly.
High areas.										
I.....	1, a. m.	45	90	3, a. m.	33	75	Miles. 1,200	Days. 2.0	Miles. 600	Miles. 30.0
II.....	2, p. m.	47	125	3, p. m.	44	68	4,480	6.0	748	31.2
III.....	4, p. m.	48	124	7, a. m.	33	99	1,880	2.5	751	31.3
IV.....	5, p. m.	52	105	11, p. m.	34	77	2,800	6.0	533	22.2
V.....	6, p. m.	41	126	11, p. m.	41	100	2,200	5.0	439	18.3
VI.....	15, a. m.	39	123	23, a. m.	37	71	2,670	8.0	459	19.1
VII.....	23, a. m.	54	115	30, a. m.	38	81	3,150	7.0	450	18.8
Total.....							19,790	36.5	3,980	
Mean of 7 paths.....							2,827	5.2	568	23.7
Mean of 36.5 days.....									542	22.6
Low areas.										
I.....	1, a. m.	38	106	4, p. m.	47	81	1,500	3.5	429	17.9
II.....	4, p. m.	48	103	6, p. m.	43	83	1,310	2.0	657	27.4
III.....	6, a. m.	34	94	8, a. m.	31	80	1,160	2.0	582	24.3
IV.....	6, p. m.	50	117	10, p. m.	39	100	2,080	4.0	520	21.0
V.....	10, p. m.	53	118	19, p. m.	41	95	4,300	3.5	505	21.0
VI.....	19, p. m.	46	78	21, p. m.	46	65	2,680	2.0	815	18.1
VII.....	20, a. m.	41	125	23, a. m.	50	89	2,080	2.0	1,047	43.7
VIII.....	23, a. m.	52	111	30, a. m.	47	59	2,900	4.0	725	30.3
IX.....	23, a. m.	51	122	"	50	94	1,500	3.0	500	20.8
Total.....							17,410	31.0	5,268	
Mean of 9 paths.....							1,934	3.4	585	24.4
Mean of 31 days.....									568	23.4

* July 1, a. m.

HIGHS.

No. I was the continuation of VII of the May REVIEW. Its velocity of 16 miles per hour in May was accelerated to 25 miles in June, as it advanced southeast to the south Atlantic Coast, where it was last noted a. m. of the 3d. As noted in the May REVIEW, there was this month also a general motion of highs II, III, V, and VI first along the Pacific Coast northward, and then east or southeast toward the Atlantic Coast, where II and VI disappeared p. m. of the 8th and a. m. of the 23d, respectively; V was last noted in Nebraska p. m. of the 11th, and III in Texas a. m. of the 7th. It is probable that this northward shift of these highs was due to the apparent motion of the Pacific permanent high.

The general track of the highs was along rather high latitudes. Nos. I, IV, VI, and VII united with the permanent Atlantic high pressure area.

The heaviest rains of the month were on the 4th in the Gulf States between high II and the permanent Atlantic high. Apparently the presence of a well-defined low was not needed for these rains.

LOWS.

Most of the storms of the month began to the north of

Montana, and their general track was eastward to the north of our stations of observation. Only one, No. VII, began off the Pacific Coast.

Two of these storms, VI and VIII, reached the Gulf of St. Lawrence; all the rest were dissipated or filled up in the interior of the country.

The heaviest rainfall in northern latitudes occurred on the 17th in the Lake Region. In this case low area No. V was central in Assiniboia, the pressure at Medicine Hat, 29.18, was the lowest of the month. Since the distance from this low to the region of rainfall was over 1,200 miles it is highly probable that the rain was due to secondary conditions which, however, do not appear by bendings of isobars or wind directions.

The thunderstorms of the month reached a culmination on the 14th and 15th in the evening and on the 23d in the morning.

LOCAL STORMS.

By A. J. HENRY, Chief of Division of Records and Meteorological Data.

2d.—David, Indian Ter. (1 mile southwest of Chelsea), 6 p. m. central time; 1 killed, 8 injured; property loss, \$3,000; path from 200 yards to $\frac{1}{2}$ mile wide, length uncertain, said to be 30 miles; moved to the east. Heavy rains and winds throughout portions of eastern Texas on the 2d and 3d injured growing crops and wrecked possibly as many as 30 buildings, the greatest destruction at a single place occurring at Grand Prairie, within 13 miles of Dallas. Newspaper reports place the damage to crops at a quarter of a million dollars.

3d.—On this date severe local storms were reported from Texas, Mississippi, Alabama, and New York. The storm in New York State seems to have been a true tornado. It was first observed near Westmoreland, Oneida County, at 5 p. m. eastern time. One person was killed and 3 injured. The funnel cloud is described as having an irregular swaying motion, rising and falling alternately. It moved toward the east in a path about $\frac{1}{2}$ a mile wide and 5 miles long. A conservative estimate places the amount of damage at \$18,000.

7th.—Destructive hailstorms were reported in Pratt, Reno, Sedgwick, and Sumner counties, Kans.

10th.—A widespread and rather destructive storm of wind and rain overspread eastern Colorado and the western border of Kansas on the evening of the 10th. A number of wash-outs on the railroads interfered with travel, and the damage to culverts and bridges was considerable.

Several minor tornadoes were observed in southern Minnesota on the evening of the 10th. In most cases the funnel cloud at the point of contact with the earth was quite small; the whirl covered a small area and the destruction of life and property was not great. The most severe whirl originated in Lyle Township, Mower County, near the State line, and moved eastward rather slowly, being clearly visible when a mile away. But 1 person was killed although 22 were more or less injured. The property loss was probably \$10,000. Path of the storm 80 rods wide, 6 miles long; moved east.

The second storm of importance was first observed north of Mapleton, Blue Earth County, about 4 p. m., central time. It moved a little north of east into Waseca County, passing near Little Cobb and Alma City, where it was last observed. Two persons were injured and the property loss probably reached \$6,000. The path of the storm was quite narrow, probably 100 feet on the average, and the distance traveled was about 12 miles. The third storm formed about 2 p. m. in Kandiyohi County, near the railroad station of the same name. No casualties; path, 20 feet wide; 3 miles long; property loss about \$1,000; moved northeast.

The tornado cloud was closely observed by Mr. Charles U. Peterson, who remarks upon it as follows: